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FIGURES

Fig. 1.

A

```
TatA(Eco)    M-GGISIWQLLIIAVIVVLLFGTKKLG----------------------------   26
TatE(Eco)    M-GEISITKLLVVAALVVLLFGTKKLR----------------------------   26
TatAy(Bsu)   M--PIGPGSLAVIAIVALIIFGPKKLP----------------------------   25
TatAd(Bsu)   MFSNIGIPGLILIFVIALIIFGPSKLP----------------------------   27
TatAc(Bsu)   M--ELSFTKILVILFVGFLVFGPDKLP----------------------------   25
TatB(Eco)    MF-DIGFSELLLVFIIGLVVLGPQRLPVAVKTVAGWIRALRSLATTVQNELTQELKLQ   49
             *    ..   . ..  .   ...*. .*

TatA(Eco)    ---------------SIGSDLGASIKGFKKAMSDDE----PKQDKTSQDADFTAKTI   64
TatE(Eco)    ---------------TLGGDLGAAIKGFKKAMNDDD----A-AAKKGADVDLQAEKL   63
TatAy(Bsu)   ---------------ELGKAAGDTLREFKNATKGLT----SDEEEKKKEDQ------   57
TatAd(Bsu)   ---------------EIGRAAKRTLLEFKSATKSLV----SGDEKEEKSAELTAVK-   64
TatAc(Bsu)   ---------------ALGRAAGKALSEFKQATSGLT----QDIRKNDSEN-----K-   57
TatB(Eco)    EFQDSLKKVEKASLTNLTPELKASMDELRQAAESMKRSYVANDPEKASDEAHTIHNP  114
                             ... .   .. ... * ..           ..  .

TatA(Eco)    ADKQADTNQE-------------------------------QAKTEDAKRHDKEQV   89
TatE(Eco)    SHKE----------------------------------------------------   67
TatAy(Bsu)   --------------------------------------------------------   57
TatAd(Bsu)   ---------------------------------------------------QDKNAG   70
TatAc(Bsu)   ---------------------------------------------------EDKQM-   62
TatB(Eco)    VVKDNEAAHEGVTPAAAQTQASSPEQKPETTPEPVVKPAADAEPKTAAPSPSSSDKP  171
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B

```
TatC(Eco)    MSVEDTQ--PLITHLIELRKRLLNCIIAVIVIFLCLVYFANDIYH-LVSAPLIK   51
TatCy(Bsu)   MTRMKVNQMSLLEHIAELRKRLLIVALAFVVFFIAGFFLAKPIIVYLQETDEAK   50
TatCd(Bsu)   MDKKETH---LIGHLEELRRRIIVTLAAFFLFLITAFLFVQDIYDWLIRDLDGK   51
             *.  ...   *..*. ***.*..     *   ....    ... *   *  .   *

TatC(Eco)    QLPQGSTMIATDVASPFFTPIKLTFMVSLILSAPVILYQVWAFIAPALYKHERR  105
TatCy(Bsu)   QL----TLNAFNLTDPLYVFMQFAFLIGIVLTSPVILYQLWAFVSPGLYEKERK  104
TatCd(Bsu)   -------LAVLGPSEILWVYMMLSGICAIAASIPVAAYQLWRFVAPALTKTERK   98
                   . . . .. ... . .. . ..  . **  **.* *..*.* . **.

TatC(Eco)    LVVPLLV---SSSLLFYIGMAFAYFVVFPLAFGFLANTAPE-GVQVSTDIASYL  155
TatCy(Bsu)   VTLSYI---PVSILLFLAGLSFSYYILFPFVVDFMKRISQDLNVNQVIGINEYF  155
TatCd(Bsu)   VTIMYIMYIPGLFALFLAGISFGYFVLFPIVLSFLTHLSSG-HFETMFTADRYF  151
             ...  .        ** *..*.*...**.. .*. . . . .   . .    *.

TatC(Eco)    SFVMALFMAFGVSFEVPVAIVLLCWMGITSPEDLRKKRPYVLVGAFVVGMLLTP  209
TatCy(Bsu)   HFLLQLTIPFGLLFQMPVILMFLTRLGIVTPMFLAKIRKYAYFLLLVIAALITP  209
TatCd(Bsu)   RFMVNLSLPFGFLFEMPLVVMFLTRLGILNPYRLAKARKLSYFLLIVVSMLITP  205
              *...* ..**  *..*. ...* ..** .* * * *        .*..  *.**

TatC(Eco)    PDVFSQTLLAIPMYCLFEIGVFFSRF-KVGKGRNREEENDAEAESEKTEE  258
TatCy(Bsu)   PELLSHMMVTVPLLILYEISILISKAAYRKAQKSSAADRDVSSG-----Q  254
TatCd(Bsu)   PDFISDFLVMIPLLVLFEVSVTLSAFVYKKRMRE-----ETAAA-----A  245
             *. .*. .. .*.  *.*... .*   *    ..      .....     .
```

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Fig. 2.

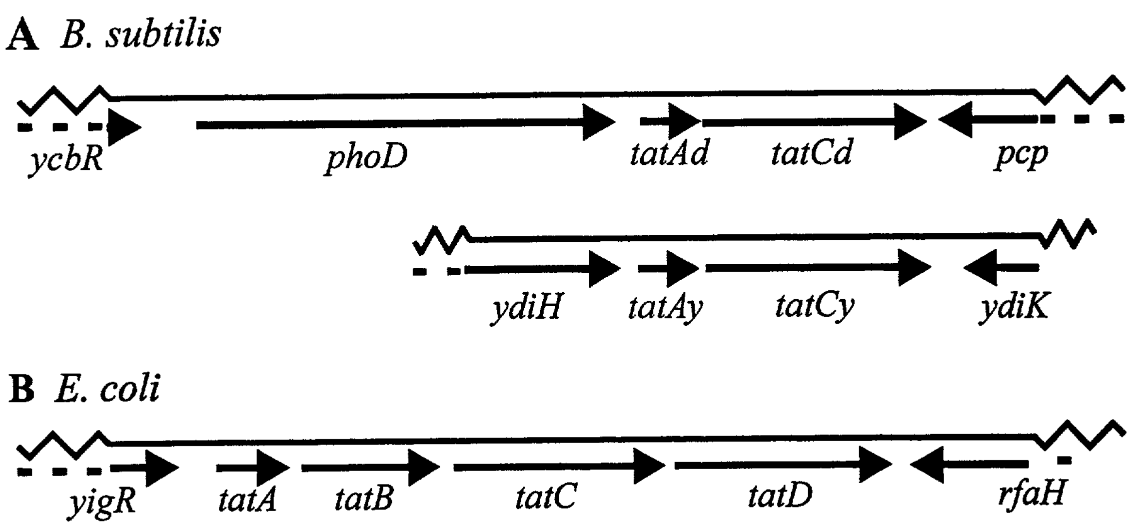

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Fig. 3.

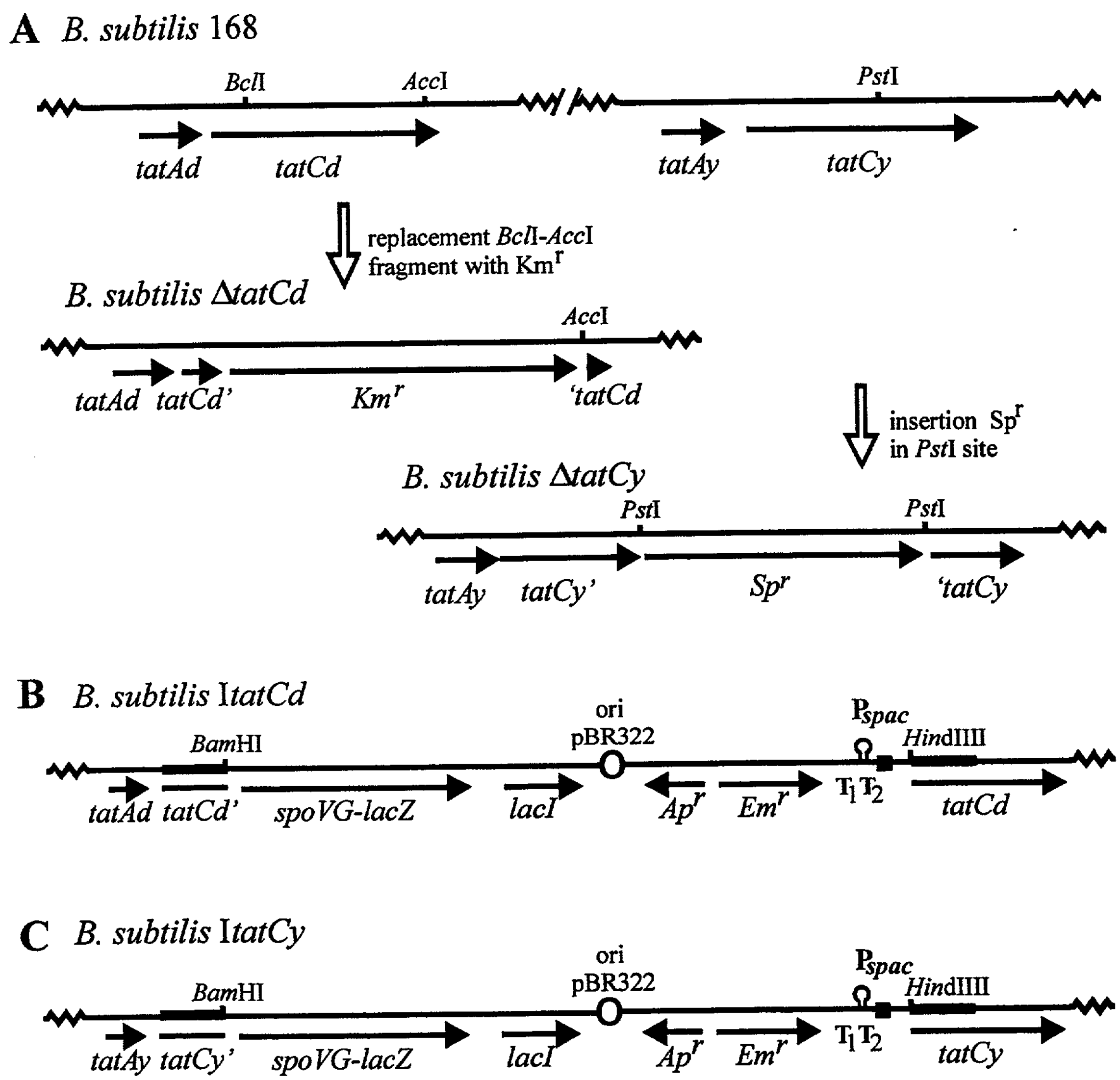

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Fig. 4.

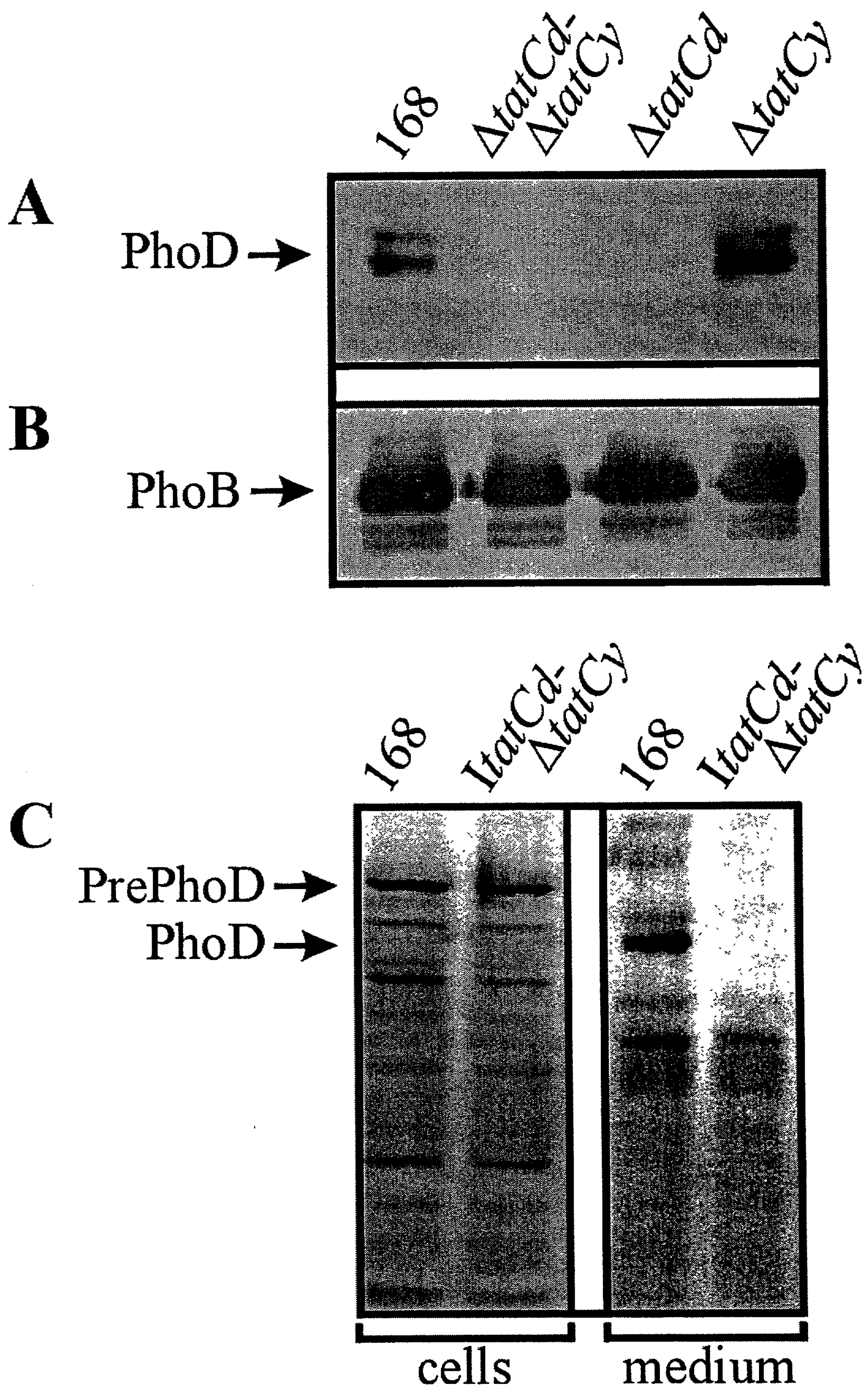

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Fig. 5.

168 $\Delta tatCd$-$\Delta tatCy$

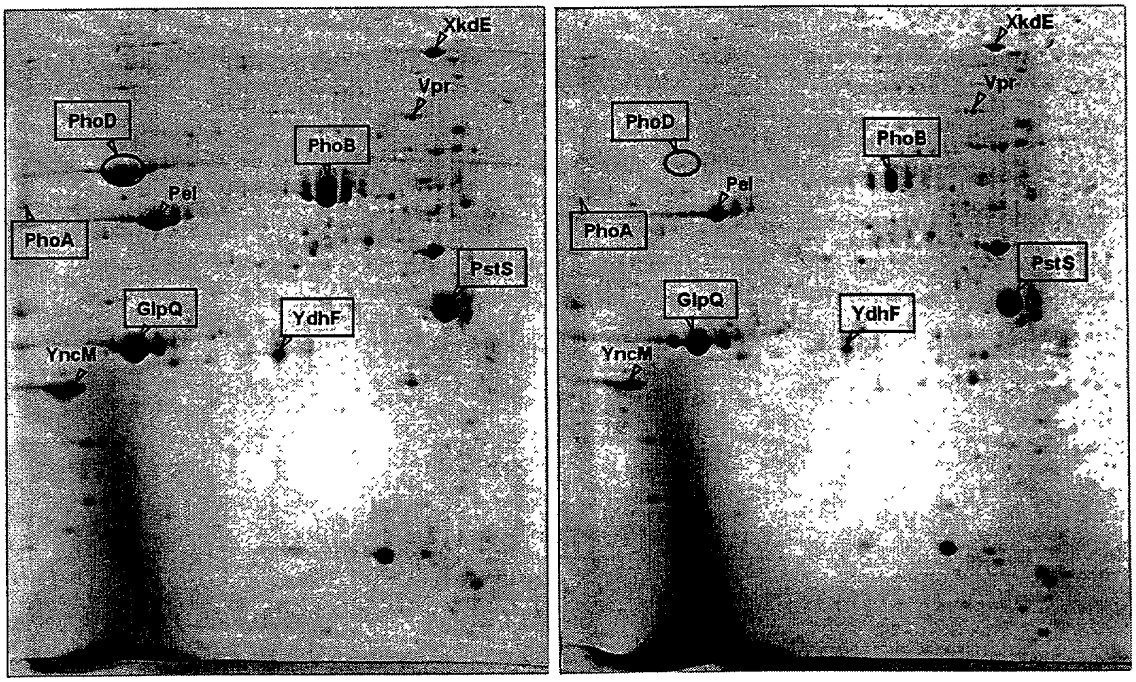

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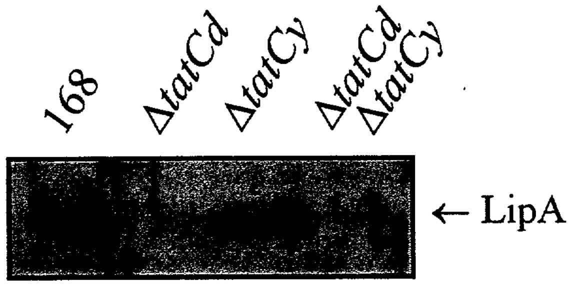
FIGURE 6



. Tat-dependent secretion of the *B. subtilis* lipase LipA. *B. subtilis* 168 (parental strain), *B. subtilis* Δ*tatCd*, *B. subtilis* Δ*tatCy*, or *B. subtilis* Δ*tatCd*-Δ*tatCy* were grown in TY-medium to end-exponential growth fase. To study the secretion of LipA, *B. subtilis* cells were separated from the growth medium by centrifugation. Proteins in the growth medium were concentrated 20-fold upon precipitation with trichloroacetic acid, and samples for polyacrylamide gel electrophoresis (SDS-PAGE) were prepared. Secreted LipA in the growth medium was visualized by SDS-PAGE and Western blotting, using LipA-specific antibodies.

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FIGURE 7

Predicted twin-arginine (RR-)signal peptides of *B. subtilis*[1]

Protein	N	h	RR-Motif	H	h	C
AlbB	1	0.1	RRILL	27	2.0	AIA
AmyX [TM]	9	-0.8	RRSFE	15	1.1	-
AppB [TM]	8	0.5	RRTLM	19	2.3	-
LipA	7	-1.1	RRIIA	19	1.2	AKA
OppB [TM]	8	-0.6	RRLVY	24	2.0	-
PbpX	2	-2.2	RRRKL	14	2.9	WNA
PhoD	3	-1.3	RRKFI	17	0.9	VGA
QcrA [TM]	1	-1.1	RRQFL	19	1.3	-
TlpA [TM]	1	-0.8	RRLII	21	2.4	-
WapA [W]	1	-3.0	RRNFK	18	2.3	VLA
WprA	8	-1.7	RRKFS	20	1.9	AAA
YceA [TM]	1	-0.4	RRAFL	21	2.2	-
YesM [TM]	1	-1.5	RRMKI	20	2.4	QYA
YesW	1	-1.3	RRSCL	19	2.0	VKA
YfkN [TM]	1	-1.2	RRTHV	17	1.7	IHA
YkpC	8	-1.0	RRVAI	17	2.3	SLA
YkuE	1	-1.3	RRQFL	17	1.0	GYA
YmaC	7	0.0	RRFLL	15	2.4	YSL
YubF [TM]	9	-2.7	RRNTV	23	2.0	-
YuiC	8	0.2	RRLLM	20	1.9	IEA
YvhJ [TM]	2	-1.7	RRKIL	18	2.5	-
YwbN	1	-1.8	RRDIL	23	1.4	QTA

[1] The listed signal peptides contain, in addition to the twin-arginines, at least one other residue of the consensus sequence (R-R-X-ϕ-ϕ; printed in bold). The number of residues in the N- and H-domains of each signal peptide, and the average hydrophobicity (h) of each of these domains, as determined by the algorithms of Kyte and Doolittle (Kyte, J., and R. F. Doolittle [1982] A simple method for displaying the hydropathic character of a protein. J. Mol. Biol. 157:105-32), are indicated. Furthermore, the RR-motifs in the N-domain, and SPase I recognition sites in the C-domain (*ie.* positions -3 to -1 relative to the predicted SPase cleavage site) are shown. Proteins lacking a (putative) SPase I cleavage site, some of which contain additional transmembrane domains, are indicated with "TM". One protein containing cell wall binding repeats is indicated with "W".

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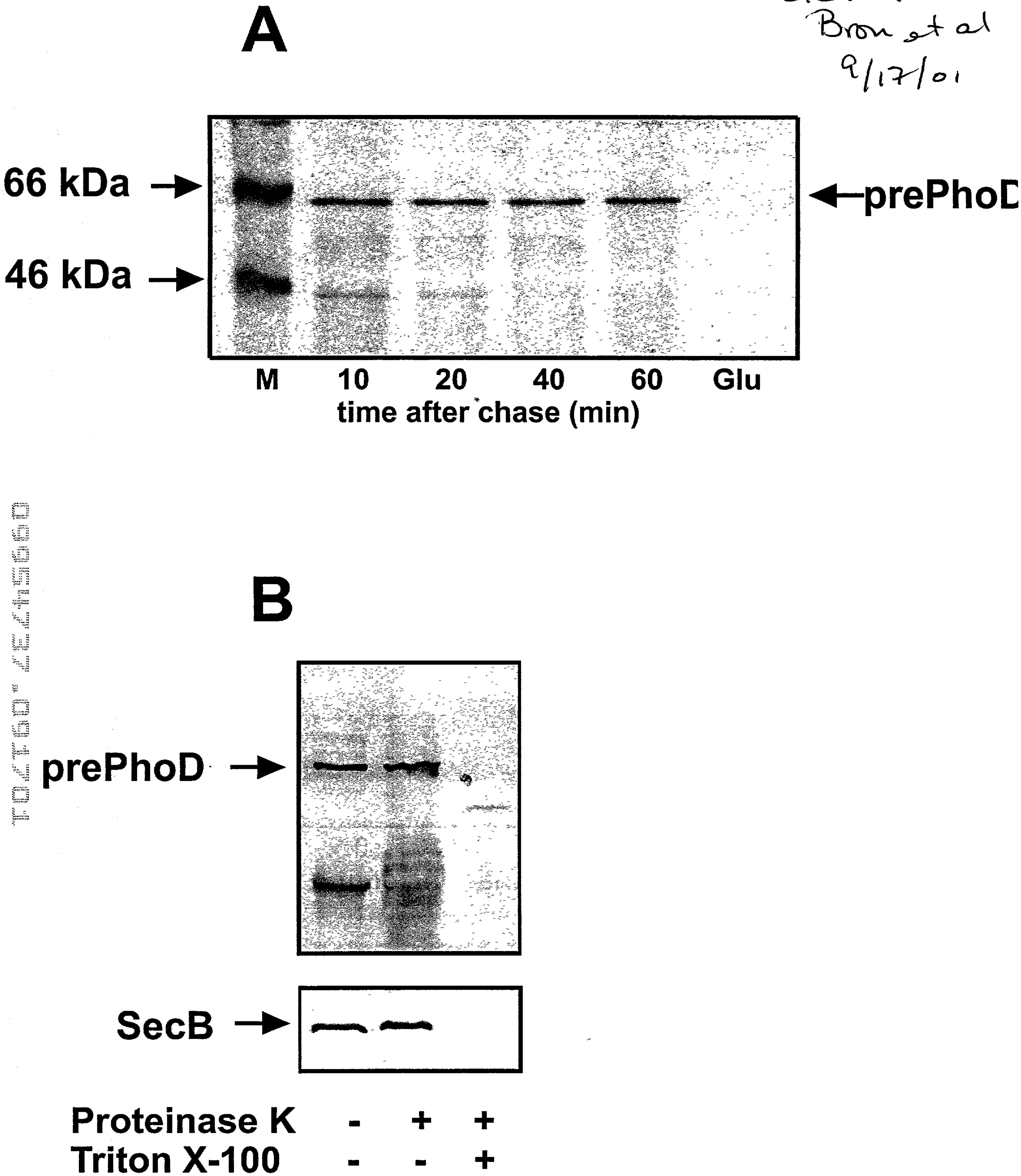

Figure 8

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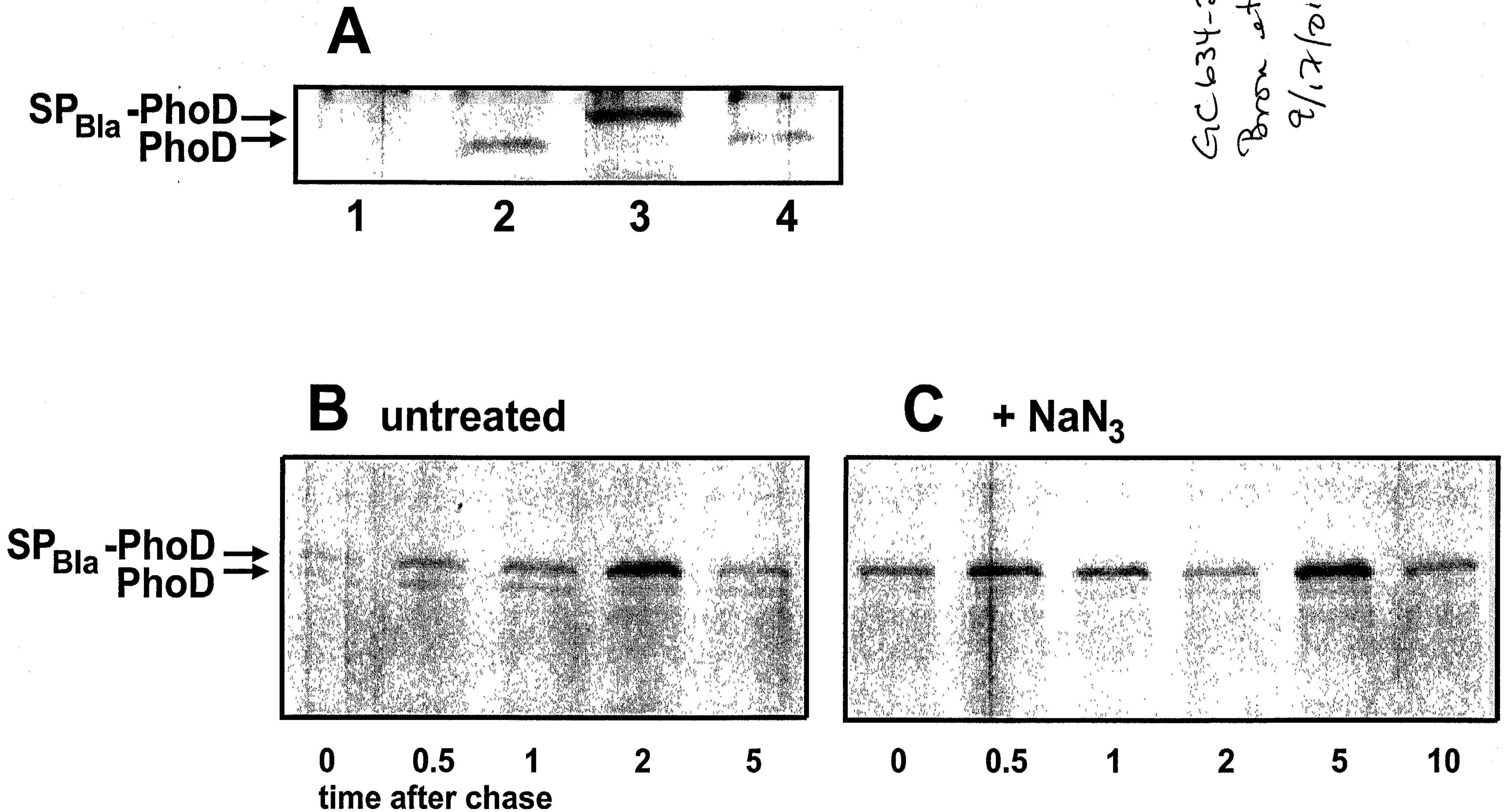

Figure 9

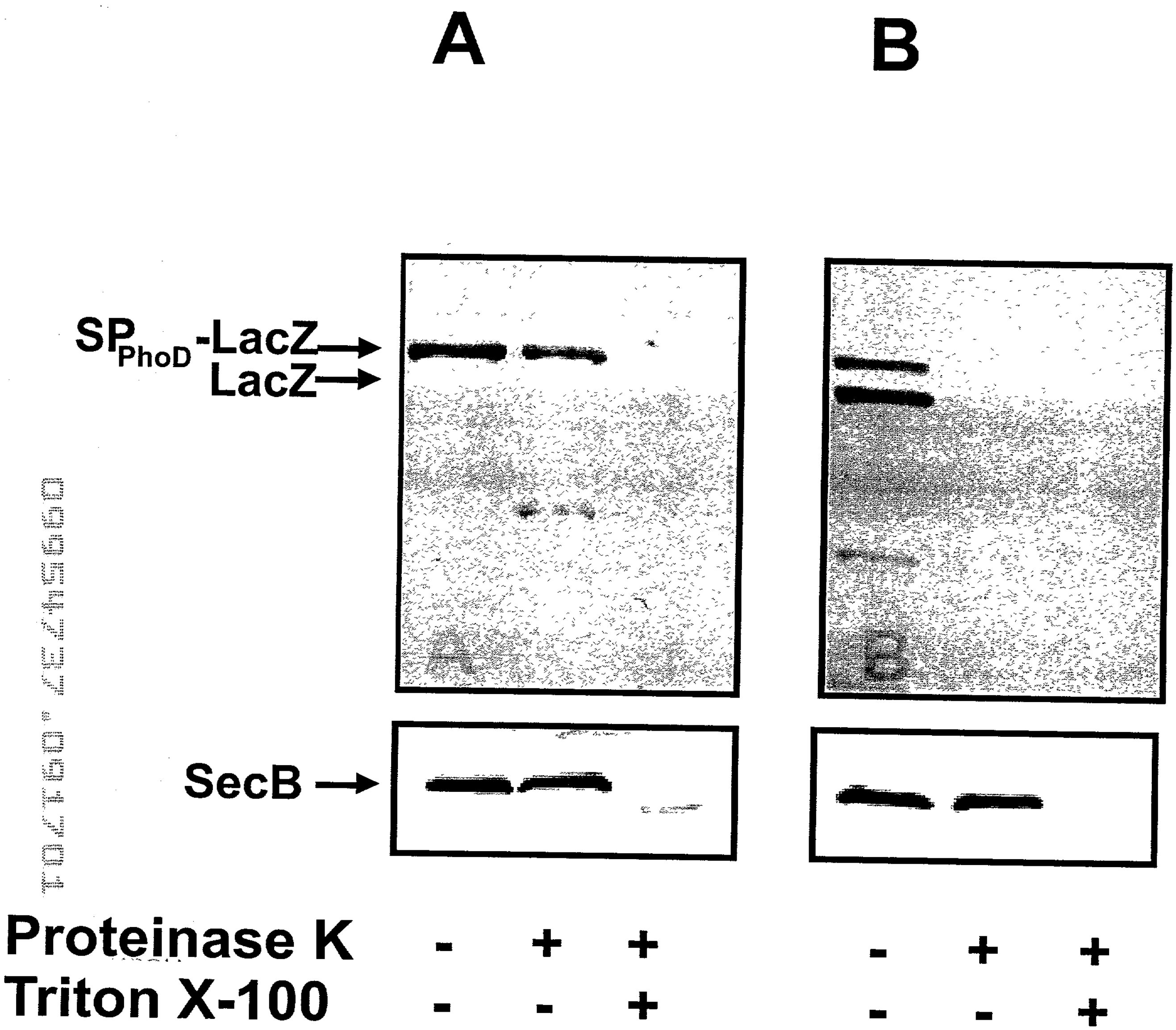

Figure 10

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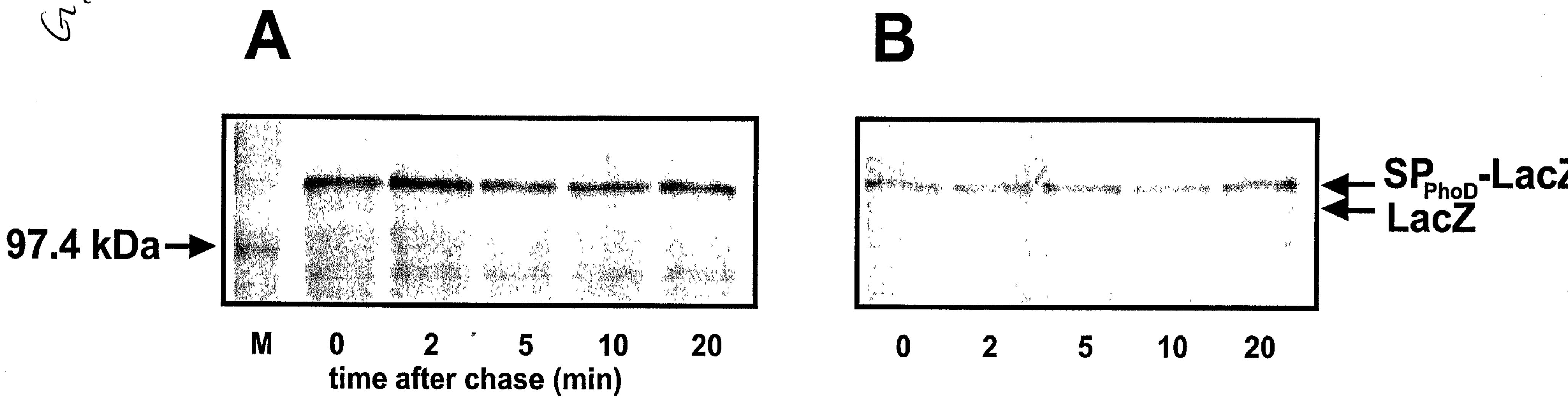

Figure 11

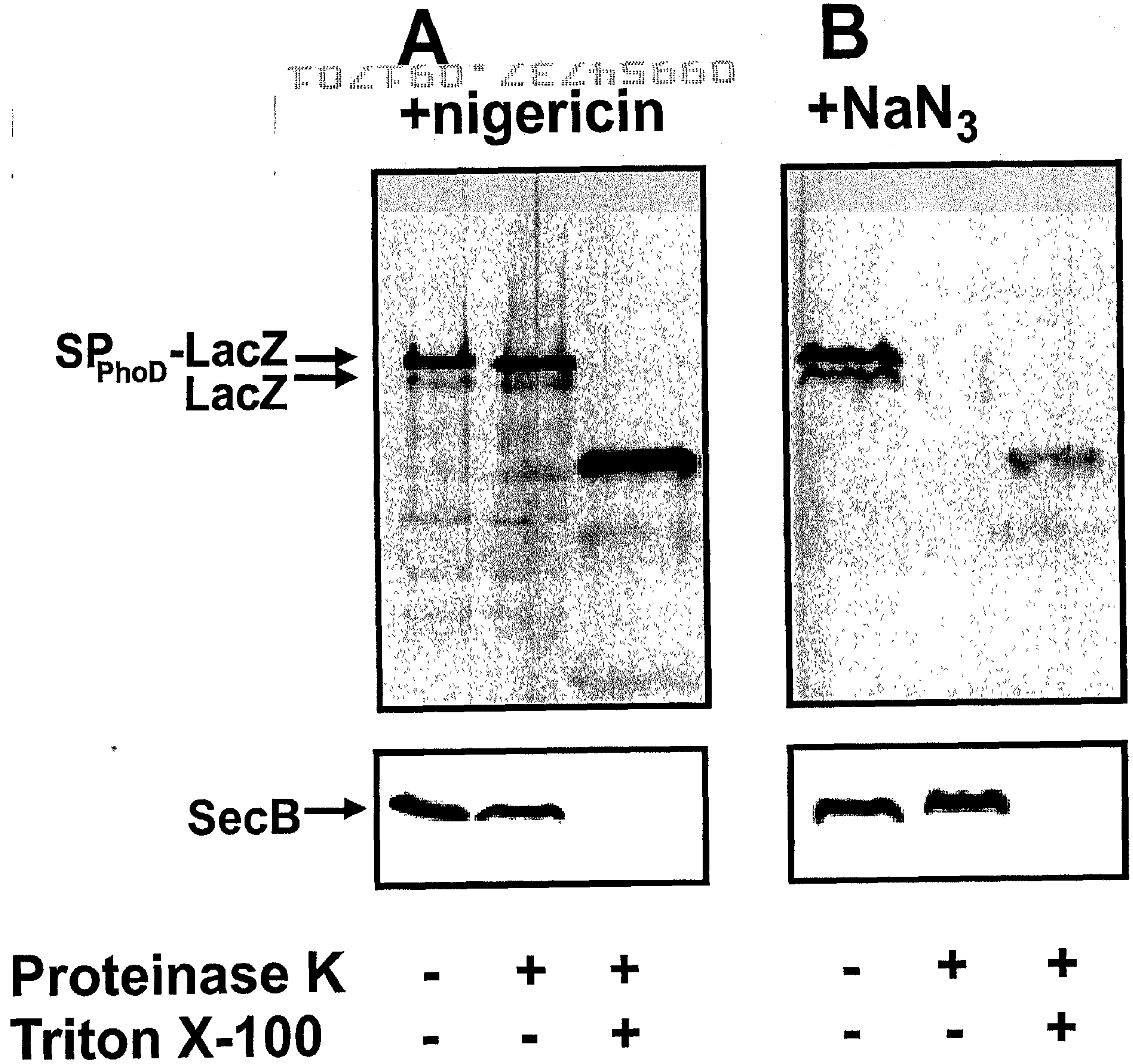

Figure 12

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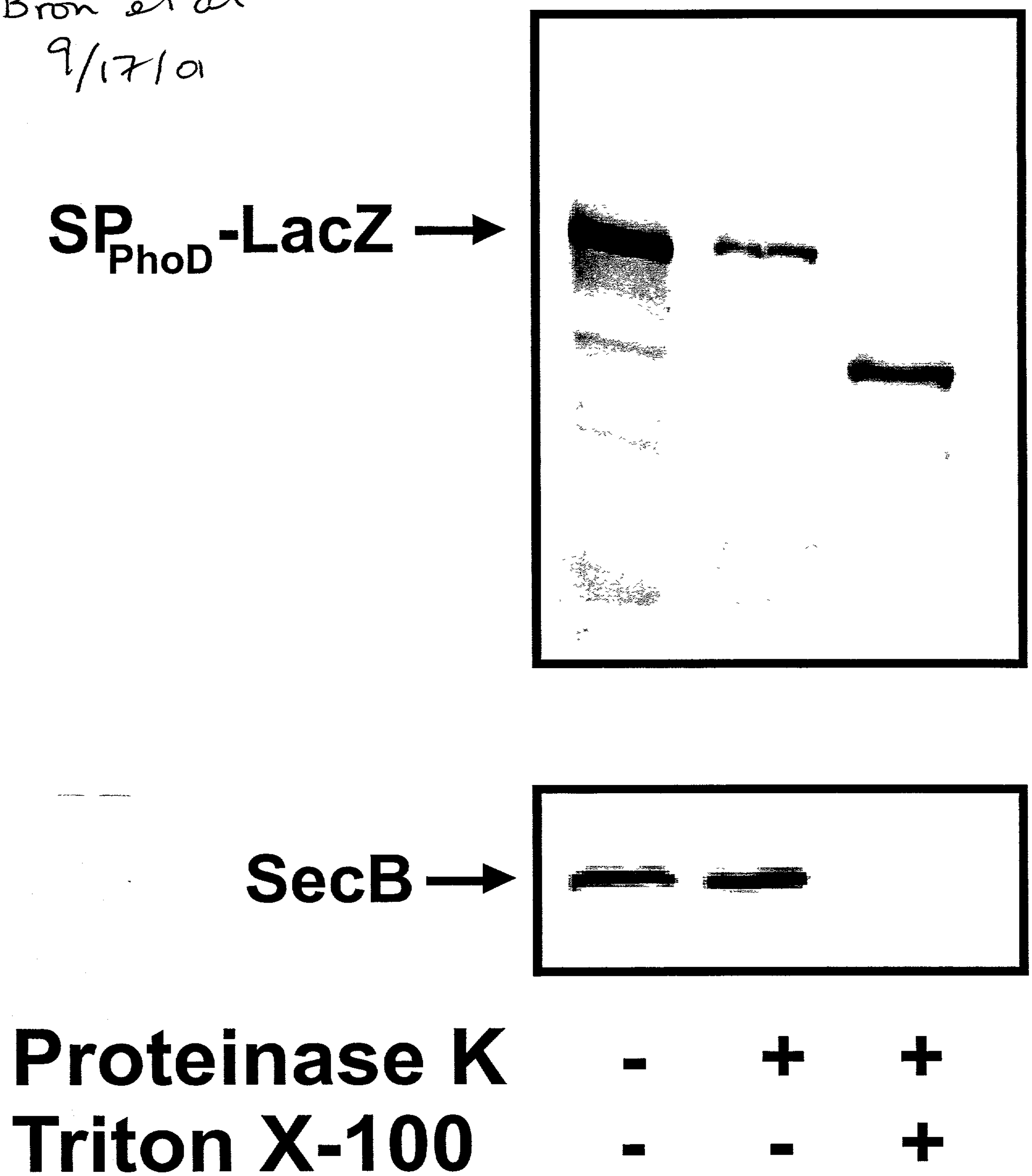

Figure 13

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Figure 14
Homologs in B. alcalophilus

TatA
MGGLSVGSVVLIALVALLIFGPKKLPELGKAAGSTLREFKNATK
GLADDDDDTKSTNVQKEKA

TatC
MTMMTPNQQTSKKKKRKGRKGRVPMQDMSIMDHAEELRRRIF
VVLAFFIVALIGGFFLAVPVITFLQNSPQAADMPFNAFRLTDPLRV
YMNFAVITALVLIIPVILYQLWAFVSPGLKENEQKATLAYIPIAFL
LFLAGIAFSYFILLPFVISFMGQMADRLEINEMYGINEYFSFLFQL
TIPFGLLFQLPVVVMFLTRLGVVTPTFLRKIRKYAYFALLVIAGII
TPPELTSHLFVTVPMLILYEISITISAITYRKYHGTTDHNGQESAK